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ABSTRACT

This series of population exercises for undergraduate use aims at bringing the student to the realization that he is a population actor and that his attitudes, values, and behavior are the raw material of population analysis. The following exercises engage the student by personal involvement and by case study approach in the use of demographic tools for analysis. A Population Autobiography includes both personal and collective activities. A Demographic Riddle exposes the student to the concept of exponential growth. The Blackout opens inquiry into factors affecting fertility. Use of Census Data familarizes the student with census data, the concept of Standard Metropolitan Statistical Areas (SMSA), and the idea of racial differences in residential patterning. Values clarification fits population values into the student's larger values system. Community Population Growth, Risk Population, and Population Forecasts are illustrated by newspaper reports. Simple Measures of Mortality and Fertility and Standardization are conveyed through exercises related to specific situations in India, the United States and South Africa. (JH)

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POPULATION WORKBOOK

A SERIES OF LEARNING EXERCISES
IN POPULATION STUDIES FOR UNDERGRADUATES

SO 007 434

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POPULATION AUTOBIOGRAPHY

INTRODUCTION

Although you are just beginning your studies about population, you already know much more than you may realize. *All of us are population actors.* During our lifetimes, we experience events and make decisions that are demographic or population-related, yet we do not always recognize them as such. Indeed, our births and our deaths, setting the limits of our lifetimes as they do, are population events. When we move to a city or to suburbia or to another state, we exercise demographic options. When we decide to marry or not or to have children or not, our decisions are population ones.

Consider, for example, the patterns of population distribution that have led to the growth of the suburban areas that surround our great urban centers. The movement of large numbers of persons into suburbia has greatly altered the patterns of residence in this country. Only 50 years ago, one-half of all Americans lived on farms or in small towns and a relatively small number lived in large cities. Today, seven of every ten Americans live in metropolitan areas and increasing numbers of these persons are settling in suburban communities.

This transformation is one of the most important population shifts in our country's history. It has also contributed to some of the nation's most serious problems: congestion, pollution, changing demands for services, and inequalities in income and tax revenues. In some metropolitan areas, the growing proportion of blacks and other minorities in the city, surrounded by an overwhelmingly white suburban population, poses a serious challenge to the prospect of racial harmony and social justice.

But who has built suburbia? We have! This redistribution of population involves thousands of separate decisions made by individuals, the population actors, who have acted as home buyers, builders, realtors, and lenders. If you and your family have moved to suburbia, if you have moved from a rural area to the city, or even if you have remained where you have always lived, you have contributed to the new pattern of population distribution in the United States. And together with millions of others, you share a responsibility for the consequences of these patterns.

The same is true for other demographic matters. A fertility rate, for example, is the product of the decisions of millions of population actors to have or not to have children. The numbers deciding to have children and the numbers that they decide to have often fluctuate, causing great consternation to those persons who seek to understand reproductive behavior, perhaps even your own professor. But the answers lie with us as population actors, and the options that we choose to exercise. *The raw materials of population analysis are our own attitudes, values, and behavior.* Since we all know our own behavior, hopes and plans better than anyone else, we know a great deal of what might be called *folk demography*.

DIRECTIONS

Accordingly, as a beginning exercise, develop your own *population autobiography*. In this statement about yourself, outline the population events in your life — past, present, and future. You may want to divide your lifetime into three convenient periods: (1) the period between your birth and the present, (2) the "near future" — those years immediately ahead when you complete school, and (3) the more distant future, which, for most persons of your age, should reach well beyond the year 2025. In these periods, what decisions have already been made for you, what options will you soon be exercising, and what challenges lie ahead? The times that you have moved, the plans that you might formulate for your own families, and your occupational prospects and related decisions could be among the many items that you include in your population autobiography.

These autobiographical reflections should be written as part of your "population workbook," but they remain your property, and, as such, they are confidential. Only your instructor will see them.

THIS LEARNING EXERCISE WAS PREPARED AS PART OF A PROJECT FOR THE IMPROVEMENT OF UNDERGRADUATE EDUCATION IN POPULATION STUDIES CONDUCTED AT LAWRENCE UNIVERSITY, APPLETON, WISCONSIN 54911. YOUR COMMENTS ARE INVITED.

With the completion of your population autobiography, you should be at a quite different starting point for a course in population problems than you might have thought yourself to be. Hopefully, your autobiographical statement has demonstrated two things to you.

First, *you are a population actor.* Many of the decisions that you have made and will make are of demographic importance. When combined with the similar decisions of others, they will determine the course of population growth and its distribution in the United States. As a result, you share responsibility for the consequences of your demographic actions.

Second, *you already know a great deal about population.* In one of Plato's dialogues, there is an account of Meno's slave boy in which Socrates demonstrates to Meno that his uneducated household servant "knows" very complex ideas in geometry. Through a process that Plato calls "mental midwifery", Socrates asks a series of questions to which the answers of Meno's slave boy demonstrate his understanding. Your autobiography should demonstrate your knowledge of population matters. All that your teacher and you need to do now is to refine the knowledge.

To help in this process, the exercise will conclude with two other aids to understanding. First, a number of population vignettes of college students are provided. Through them, you can identify the various events that interest demographers. Second, a detailed questionnaire on population matters is provided. It provides a convenient checklist of items that you may have overlooked in writing your autobiography. You might find it of interest to complete the questionnaire just as if you were responding to the Census or a sample survey. (Note: It might be an interesting project to collect the information from your fellow students and develop a population profile of your class.)

POPULATION VIGNETTES

MARY is a 21-year-old college senior who lives in Chicago. She is of Polish-Catholic descent and has been raised to appreciate her ethnic heritage. All of her grandparents were born in Poland. Her parents were born and raised in a Polish section of the city. Mary has four younger brothers and a younger sister. Large families are common on both sides of her family and religion is an important factor in determining their size.

Age, Sex, Community
Religion
Ethnicity

The family has moved twice during the past 20 years resulting from a combination of economic mobility, a growing family, and increasing racial tensions. Their current residence is a single-family dwelling in a relatively new, lower-middle class residential area of Chicago.

Migration (Intra-Urban)

Mary is the first in her family who has even seriously considered college. She sees a distinct break with her family's lifestyle. It exerts great pressure on her and twelve years of Catholic education have had their effect. However, her liberal college education may prove to be the deciding influence. She intends to go to graduate school and eventually on to a career in public health. By choice and by occupation, a large city will probably be her home. Marriage does not fit anywhere in the near future and raising a family is not one of her goals.

Educational Attainment
Occupational Plans
Marriage Plans

BARBARA, 19 years old, attends college in Wisconsin. Her family lives in a metropolitan area in Ohio. She was born in a city, but her family has subsequently moved to a suburban community where she has lived for the last 16 years.

Migration (Urban-Surburban)

AL is a 20-year-old college junior from Baltimore. He is Jewish and although he seldom attends services at the synagogue, he is proud of his heritage. His grandparents were Jews and came to America to escape persecution and to find the Promised Land. Al's father is a lawyer and his mother is a social planner. They were divorced in 1968, but both continue to live in Baltimore.

Religion
Immigration
Marital Dissolution (Divorce)

Al attended a private school in Baltimore before going to college in New York City. He hopes to attend law school, preferably in the East and he can foresee several other moves before he settles down to

Migration

establish his law practice in a large city on either coast. He plans on marrying and having two children.

Marriage
Family Size Preference – 2

AMY is an 18-year-old black in her sophomore year at a Texas university. She was born in Atlanta, Georgia, but she moved to Dallas when she was six. Amy is the oldest of four children. Her three younger sisters still live at home.

Race

Migration

Amy's career interests center on journalism, and she would like to work for a magazine or in television after graduation. Amy has no plans to marry or to have children because she feels that her career and achievements through it are more important, despite what her mother says.

Career

Non-Marriage
Family Size Preference – 0

FRANK is in his second year at a large state university in the Midwest where he is studying food technology. Born and raised on a farm, he has no intention of returning to his native Iowa when he graduates. Instead, he hopes to follow his two brothers to a large city where he can obtain a job in the production or sale of agricultural products. Since there are no children remaining at home, Frank often wonders what lies ahead for his parents' farm and the small town where he grew up. Already, more than two-thirds of his graduating class have moved away.

Migration (Urban-Rural)

Community Future

Depopulation

CARL is a 23-year-old graduate student in civil engineering at a large university in Oregon. He has been married for two years and he and his wife, Jeanne, have a one-year-old daughter. Both Carl and Jeanne come from large families and they want three or four more children or as many as they can support. Jeanne is presently working, but she will quit her job as soon as Carl graduates so she does not have to leave her child with neighbors. Also, she would like to have children as soon as possible so that they are not spaced too far apart.

Marital Status

Fertility

Family Size Preference – Large

(Non) Female Labor Force Participation

Spacing

JUDY attends a commuter college in New York State. She hopes to finish her studies in the near future, but her plans are very uncertain. Judy's father died when she was a freshman and the family's finances are problematic.

Mortality

Attached is a checklist of important facts that shape the lives of population actors. Some questions inquire only about the factors that influence our demographic behavior while others ask about the decisions themselves. When this list is completed, you will be able to chart the determinants and consequences of your own population behavior. While you will quickly understand the implications of most items, there will be a few that seem mysterious. These will become clear as you progress in the course.

A. Personal Characteristics

1. Sex _____ 2. Race _____

3. Year of Birth _____ 4. Age _____

5. Predicted Year of Death _____ Age at Death _____

(Sorry to be so morbid, but your career as a population actor has a beginning *and* an end. See Table 1 for help in making an estimate.)

B. Your Ancestors

6. Grandparents	Birthplace (State or Country)	Present Residence	Life Span: Date of Birth – Death
mother's mother			
mother's father			
father's mother			
father's father			

7. Parents	Birthplace (State or Country)	Present Residence	Life Span: Date of Birth – Death
mother			
father			

Date of marriage _____

Number of children _____ You are number _____ (in age).

8. Brothers and Sisters (List from oldest to youngest.)

Name	Sex	Birthdate	Birthplace
1.			
2.			
3.			
4.			
5.			

(These responses should provide a great amount of demographic data and provide even greater opportunity for speculation. Again, what does it suggest about migration? Were you, your parents, and brothers and sisters all born in the same place? What does it indicate about change in family size? How many children did your grandparents have compared with your parents? When were your parents married? What were economic and social conditions then? How might this influence their fertility decisions? Many other questions should also occur to you based upon this information.)

9. Your Migration History

	Dates	Population Size (rural, urban or suburban)
1. Birthplace		
2.		
3.		
4.		
5.		
6.		
7. Present Residence		

(Why did you and your parents move? What effects did these moves have upon your life? Do you remember changes in school, changes in friends, and changes in playground or recreational opportunities?)

C. The Near Future

10. Do you plan to marry? _____ 11. If so, at what age? _____

12. Will your spouse be older _____, younger _____, or the same age _____?

13. How many children do you want? _____ How many boys? _____ How many girls? _____ Why?

14. Would you like children immediately? _____ or would you prefer to delay having children? _____ Why?

15. Migration (as much as you can forecast)

	Next Residence	Approximate Location	Population Size	Rural/Urban/Suburb
1.				
2.				
3.				
4.				
5.				

(What will influence these moves? How will they relate to your marriage, employment, and educational decisions?)

D. The More Distant Future

What population decisions do you anticipate for the more distant periods of your life? Do you anticipate changes in job or residence in mid-career? Ooviously, many decisions cannot be anticipated at this stage in your career. But you will continue to be a "population actor". To understand this situation, please answer the following questions.

16. At what age will you be when your last child leaves home? _____

17. At what age are you likely to be a grandparent? _____

18. In what year will you retire?* _____

19. On the average, how many years of life will you face after your husband dies (or how many years will your wife face out you)?* _____

*See Table 1 for data.

TABLE 1

Average Remaining Years of Life for a person aged 20 (1969)

WHITE	MALE	50.1
	FEMALE	56.9
NON-WHITE	MALE	43.9
	FEMALE	51.2

Obviously, these are only a few of many events that will occur, but they all are important ones for you and your family to face. Your life should stretch well into the next century, perhaps to the year 2020 or more. We wish you well with your demographic decisions for those many years.

To conclude this discussion about your role as a population actor, we should consider mortality. In contemporary America, few college students give deaths, especially their own, more than a fleeting thought. Death is an event that for most young people lies well in the future, perhaps even fifty or sixty years away.

But this has not always been true. Even in this century, the probability of death was much higher for college students. In his book, *A History of Cornell* (Ithaca: Cornell University Press, 1962), Morris Bishop tells the tale of a typhoid epidemic in 1903 in which 29 students died between mid-January and the end of March (p. 421). Since the student body numbered 3,000, the death rate was high indeed. Bishop reports the reminiscences of one Cornell student:

> "For weeks the campus was fanned hourly by the wings of Death, as the bells in the tower were forbidden to ring and no man smiled or looked upon his neighbor." (ibid.)

The experience of Cornell was not unique, as many other colleges were troubled by outbreaks of typhoid and other diseases. How much more fortunate we are today! The improvement in health conditions and the virtual elimination of many infectious diseases has been dramatic since the early days of this century. But a puzzling pattern remains upon which you might wish to speculate. There are great differences in the *average* number of years that remain for various categories of students.* Consider the figures in Table 1.

Find the category in which you belong. How does it differ from the others? How do you explain these differences? What do they tell us about health and other conditions in American society? (In a sense, these questions are rhetorical, and you need not answer them here. But if you are to understand population trends and differences, they are worthy of your thought.)

* It should be noted that the figures given are for all persons aged 20. The life expectancy for college students may be different. Why? In what ways do college students differ from their peers who do not attend college? Will their life expectancy be higher or lower?

A DEMOGRAPHIC RIDDLE

INTRODUCTION

Take five minutes and solve the demographic "riddle" provided below. Please include your calculations and then answer the question that the riddle raises.

> Suppose you own a pond on which a water lily is growing. The lily plant doubles in size every day. If the lily were allowed to grow unchecked, it would completely cover the pond in 30 days, choking off the other forms of life in the water. For a long time the lily plant seems small, and so you decide not to worry about cutting it back until it covers one-half of the pond. On what day will that be?

1. Your first quick guess: the _____ day.

2. A more considered estimate (include your calculations):

ANSWER: the _____ day.

3. What are the implications of this little riddle for demographic understanding? What principle is involved?

> There is an old Persian legend about a clever courtier who presented a beautiful chessboard to his king and requested that the king give him in return 1 grain of rice for the first square on the board, 2 grains for the second square, 4 grains for the third, and so forth. The king readily agreed and ordered rice to be brought from his stores. The fourth square of the chessboard required 8 grains, the tenth square took 512 grains, the fifteenth required 16,384, and the twenty-first square gave the courtier more than a million grains of rice. By the fortieth square a million million rice grains had to be brought from the storerooms. The king's entire rice supply was exhausted, long before he reached the sixty-fourth square.

NOTE: The riddle and legend come from Meadows, et al, The Limits to Growth, **(New York: Universe Books, 1972), p. 29.**

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Try one more old parlor riddle. How many times would you have to fold a Sunday newspaper before it would reach the sun, some 93 million miles away? The riddle requires a unique, hypothetical newspaper.) Beginning with a newspaper one inch thick, the first fold doubles the pile to two inches, the next one increases it to four inches, a third fold increases it to eight inches, and so on. How many folds do you estimate that it will take? With your experience from the two earlier riddles, this should be easy.

_____times

Now check your answer on page 4.

The examples of the lily pond, the grains of rice, and the folded newspaper illustrate a concept called *exponential growth.* It can be best illustrated with the following table:

linear (or arithmetic) growth	1, 2, 3, 4, 5,
exponential (or geometric) growth	1, 2, 4, 8, 16

In the first instance, the numbers increase by single units, while in the second case, they double. Obviously, over a period of time, staggering numbers will result from this process of continual doubling.

This concept is a very important one for demographers. The comparison between geometric or exponential growth and arithmetic growth is one that formed the basis for the speculations of Thomas Robert Malthus in 1798 about the dangers of world population increase. While the consequences that Malthus predicted have yet to overcome us, population throughout the world has been on a course of exponential growth in modern times.

Consider the population growth in the world since 1650.

- Between 1650 and 1825 (175 years), the world's population doubled, 500,000,000 to one billion;
- Between 1825 and 1930 (105 years), it doubled again, one to two billion;
- Between 1930 and 1975 (45 years), it will have doubled again, two to four billion, and
- Between the present and the year 2005 (32 years), it is estimated that the population will double once again, to eight billion.

The significance of exponential population increase can also be seen in a simple example.* Consider an island inhabited by 100 people – 50 couples. Call this group Generation I. Each of these 50 couples have 3 children. These 150 children will comprise Generation II. These 150 people – 75 couples – also will have 3 children each for a total of 225 in Generation III. Even though both Generation I and II had the same number of children per couple (3), Generation II produced 75 more children than Generation I. That is exponential growth. If all of the three generations are alive, the island's population would number 475.

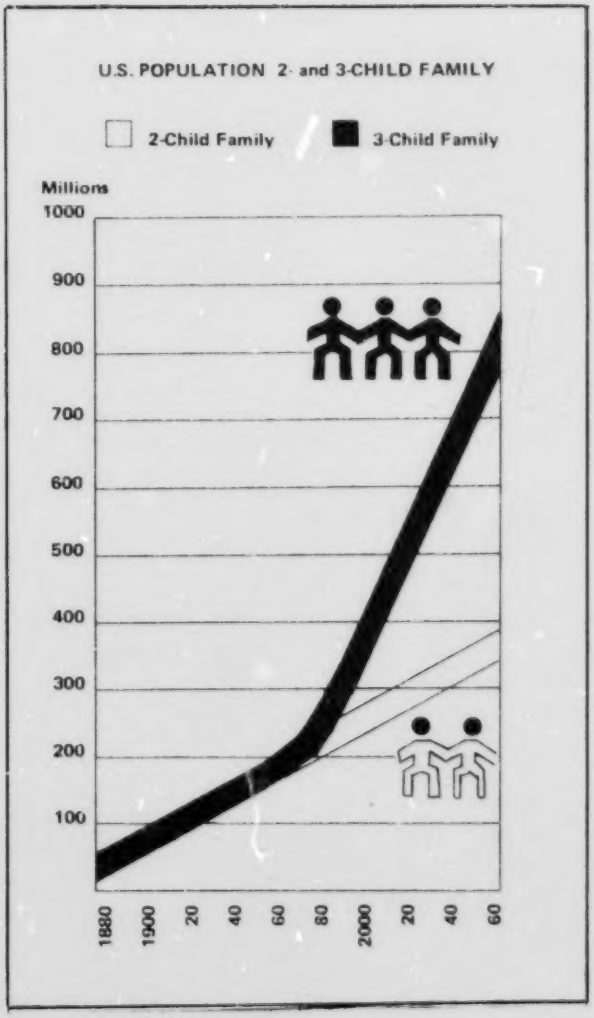
Generation I	100
Generation II	150
Generation III	225
	475

But consider what would have happened if the average number of children were two instead of three – a rate that is not exponential in increase. Generation I would still consist of 100 persons or 50 couples. They would have 2 children apiece or 100 in Generation II. The fifth couples of Generation II would also have 2 children for 100 in Generation III.

Generation I	100
Generation II	100
Generation III	100
	300

This would represent a population in a steady-state condition. The example is more than a hypothetical one. The Commission on Population Growth and the American Future examined differences in the size of the United States population in the future based upon a 2-child or a 3-child model. These small differences per family seem relatively minor, but they would aggregate into large numbers. As the diagram on page 3 shows, a 2-child family average would cause the population to grow to 271 million by the year 2000. A three-child average would cause it to reach 322 million by that year – a difference of 51 million in 27 years. Underlying this difference is the concept of exponential increases.

***Example adapted from League of Women Voters, More (Washington, 1972), pp. 7-8.**


U.S. POPULATION 2- and 3-CHILD FAMILY
2-Child Family
3-Child Family
Millions
1000
900
800
700
600
500
400
300
200
100
1880
1900
20
40
60
80
2000
20
40
60

The correct answer to the parlor riddle is 44 times as the table reproduced below illustrates. Fold 44 would take the newspaper from a thickness of 64 million miles to one well past the distance of 93 million miles between the earth and the sun. Note that nothing more is involved than doubling each number in turn — exponential growth.

TABLE 1

FOLDING A ONE INCH THICK NEWSPAPER TO FORM A STACK THAT WILL REACH THE SUN

Fold	Thickness	Fold	Thickness
1	2"	23	64 miles
2	4"	24	128 miles
3	8"	25	256 miles
4	16" or over 1 foot	26	512 miles
5	2'	27	over 1,000 miles
6	4'	28	2,000 miles
7	8'	29	4,000 miles
8	16'	30	8,000 miles
9	32'	31	16,000 miles
10	64'	32	32,000 miles
11	128'	33	64,000 miles
12	256'	34	128,000 miles
13	512'	35	256,000 miles
14	1,028'	36	512,000 miles
15	2,056'	37	over 1 million miles
16	4,112'	38	2 million miles
17	8,224' or over 1 mile	39	4 million miles
18	2 miles	40	8 million miles
19	4 miles	41	16 million miles
20	8 miles	42	32 million miles
21	16 miles	43	64 million miles
22	32 miles	44	over 100 million miles

SOURCE: Joan Fraser, The People Problem, (Bloomington, Indiana University Press, 1971), p. 7.

THE BLACKOUT

INTRODUCTION

As the levels of fertility declined throughout Western Europe, many explanations for the decline were advanced. One was the "competitive enjoyments" theory that argued that exposure to new opportunities in entertainment and other advantages connected with urbanization caused "reproductive urges" to decline. While this theory has died hard, it has died. Or has it? Consider the following two stories from *The New York Times*.

Wednesday, November 10, 1965.

POWER FAILURE SNARLS NORTHEAST
800,000 ARE CAUGHT IN SUBWAYS HERE
AUTOS TIED UP, CITY GROPES IN DARK

Snarl at Rush Hour Spreads into 9 States
10,000 in the National Guard and
5,000 Off-Duty Policemen Are Called
to Service in New York

The largest power failure in history blacked out nearly all of New York City, parts of nine Northeastern states, and two provinces of southeastern Canada last night. Some 80,000 square miles, in which perhaps 25 million people live and work, were affected...

Striking at the rush hour, the power failure trapped 800,000 riders on New York City's subways. Railroads halted. Traffic was jammed. Airplanes found themselves circling, unable to land...

(The story above discusses the power failure, lasting from 5:27 p.m., when lights and power first went out in New York City, until 4:00 a.m., when power in all areas was finally restored.)

Wednesday, August 10, 1966.

BIRTHS UP MONTHS AFTER THE BLACKOUT

by Martin Tolchin

A sharp increase in births has been reported by several large hospitals here, nine months after the 1965 blackout.

Mount Sinai Hospital, which averages 11 births daily, had 28 births on Monday. This was a record for the hospital; its previous one-day high was 18. At Bellevue there were 29 new babies in the nursery yesterday, compared to 11 a week ago and an average of 20.

Columbia Presbyterian averages 11 births daily and had 15 Monday; St. Vincent's averages 7 and had 10; Brockdale averages 10 and had 13; and Coney Island averages 5 and had 8. However, New York and Brooklyn Jewish hospitals reported that their number of births was normal...

There were 16 babies at Mount Sinai yesterday, 13 at Columbia Presbyterian, and 10 at St. Vincent's, all above average. The number of births was reported normal in Nassau and Suffolk counties, many of whose commuters were stranded in the city November 9, in Newark and Jersey City which were not affected, and in hospitals in Albany, Rochester, New Haven, and Providence, where the lights went on in mid-evening.

DIRECTIONS

From this fragmentary evidence, formulate a hypothesis with supporting reasoning that explains the surge in fertility nine months after the Great Blackout.

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THE BLACKOUT (SEQUEL)

As you might expect, the discovery by Martin Tolchin concerning the "blackout babies" caused considerable speculation. One sociologist noted that "the lights went out and people were left to interact with each other." Others attributed the phenomenon to disruption of routine, absence of television, or inability to find accustomed contraceptives in the dark.

But before great effort is expended in developing elaborate theories and hypotheses, we should determine if the phenomenon is real. J. Richard Udry did exactly that in an article, "The Effects of the Great Blackout of 1965 of Births in New York City" (Demography, 7(August, 1970), pp. 325-7). Consider what Udry reports:

> The effect of the blackout on birth rates is relatively easy to determine. Through the cooperation of Carl Erhardt and the New York City Health Department, I obtained the number of births for each calendar day for the years 1961 through 1966. I took November 10, 1965, as the date of conception for the blackout babies, and assumed that the average gestational length was 280 days, counting from the last menstrual period, and therefore about 267 or 266 days from conception. Using a distribution of gestational ages at birth derived from vital statistics (Vital Statistics of the U.S., 1965), it was estimated that more than 90 per cent of the births conceived on November 10 would have been born between June 10 and August 14. I reasoned that if there were an unusual number of conceptions on November 10, then the period between June 27 and August 15, 1966 would contain a greater percentage of the year's births than that contained by the same period in other years. Table 1 presents the percentage of the year's births occurring per week from June 27 through August 14 for the years 1961 through 1966.

TABLE 1

Births Occurring in New York City from June 29 to August 16 During the Years 1961 through 1966*

Year 19–	Mean Births per Day	Week	Pct. of year's total births	Number of births on 267th day
61	478.7	3350.6	13.9	475
62	467.2	3270.1	13.9	497
63	476.2	333.7	13.9	431
64	470.2	3291.3	13.9	406
65	467.7	3203.7	14.1	468
66	434.5	3041.6	13.9	431

Source: Unpublished tabulations furnished by the New York City Department of Health

*Except 1964, when it was June 28 – August 15

> It can be seen that 1966 is not an unusual year in this comparision. For those who still imagine that all babies conceived on a given date are also born on an exact date 267 days later, Table 1 presents the number of births and proportion of the year's births born on the date corresponding to 267 days after the blackout, also for the years 1961 through 1966. This number of births is not at all remarkable for 1966 when compared to the previous five years...
>
> For no week is the 1966 value significantly above average for the previous five years. We therefore cannot conclude from the data presented here that the Great Blackout of 1965 produced any significant increase (or decrease) in the number of conceptions...

USE OF CENSUS DATA

INTRODUCTION

This exercise is designed to introduce the student to three things: (1) the handling of data from census materials, (2) the concept of Standard Metropolitan Statistical Areas (SMSAs) and (3) a preliminary understanding of racial differences in residential patterns in the United States.

The exercise is best accomplished in the following steps:

1) Identify a SMSA to analyze. You may find that SMSAs with a single central city are easiest to handle. The 1970 Census recognizes 243 standard metropolitan statistical areas in the United States.

2) Fill out the attached form for your SMSA in 1970. Data can be found in the appropriate volume entitled, "General Population Characteristics (for the state chosen)". The volumes are in the PC(1)B series.

3) Find the comparable data in the 1960 Census. Fill out the attached form. What changes in concepts or patterns of presenting the data do you find?

SMSA or Standard Metropolitan Statistical Area "statistical unit consisting of one city with at least 50,000 inhabitants or two contiguous cities with a combined population of at least 50,000, plus those adjacent counties which are functionally integrated with the central city."

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(4) Make the comparisons requested below.

NUMBERS	Total SMSA	Central City	Remainder of SMSA
Population Change, 1960–1970			
Change in White Population, 1960–1970			
Change in Black Population, 1960–1970			
PERCENTAGES			
Population Change, 1960–1970			
Change in White Population, 1960–1970 (relative to previous white population)			
Change in Black Population, 1960–1970 (relative to previous black population)			

In a paragraph, briefly describe the changes that have taken place.

(5) Did all of this change occur from population changes?

(a) Yes _____

(b) No _____

(c) What in the h--- are you talking about? _____

Explain your response to this question. (If you checked line (c), additional information will be forthcoming.)

(6) Two ways that census data are used in the United States are to (a) fix apportionment of legislatures at various levels of government and (b) to calculate *per capita* allocations of state and federal aid to local government for services. In looking at your population figures, what do you think might have happened in these areas, (a) and (b), given the population trends that you have identified? Briefly describe the changes that might have occurred.

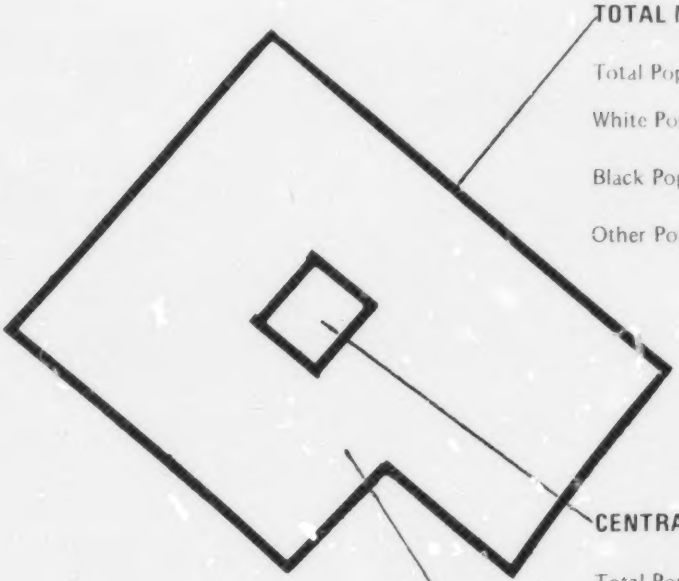
(7) If the proportion of blacks (or other minorities) in your SMSA was high (or had it been high) do you think that their numbers would have been correctly counted when apportionment or *per capita* allocations were computed or anything similar? (Note: This is not an exercise in assessing discrimination in government, but rather it is an exercise in demographic reasoning.)

DATA FROM 1960 CENSUS

SMSA Name _____

Central City (Cities) _____

County (Counties) _____



NOTE: This figure represents a stylized version of a SMSA. Its purpose is to present a visual picture of the concept. Each SMSA has unique characteristics which must be taken into account. For example, a number of SMSAs consist of more than one central city. It may be helpful to visualize the SMSA that you have chosen before you begin.

TOTAL METROPOLITAN AREA, 1960

	Pct.
Total Population	100.0
White Population	
Black Population	
Other Population	

CENTRAL CITY, 1960

Total Population	100.0
White Population	
Black Population	
Other Population	

REMAINDER OF METROPOLITAN AREA, 1960

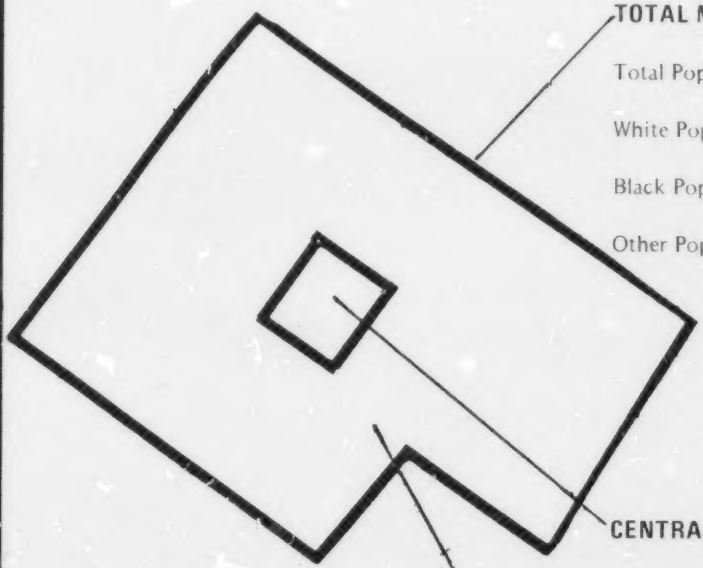
Total Population	100.0
White Population	
Black Population	
Other Population	

DATA FROM 1970 CENSUS

SMSA Name _____

Central City (Cities) _____

County (Counties) _____



TOTAL METROPOLITAN AREA, 1970

	Pct.
Total Population	100.0
White Population	
Black Population	
Other Population	

CENTRAL CITY, 1970

Total Population	100.0
White Population	
Black Population	
Other Population	

REMAINDER OF METROPOLITAN AREA, 1970

Total Population	100.0
White Population	
Black Population	
Other Population	

ROBLEMS OF UNDERCOUNTS

he two attached selections are self-explanatory. Given the nportance of the Census in determining apportionment nd in setting levels of *per capita* funding, problems of ndercounts are very serious. As the two newspaper articles uggest, there are significant undercounts of those groups ho most need correct political representation and proper unding of social services. (In fairness, one should note that he Bureau of the Census has been very candid about these roblems in its data.)

UESTIONS FOR YOUR CONSIDERATION

hat new procedure might have been introduced into the 970 Census to correct for these problems? How effective ere they? (Note: The answer to the second question, though hinted at in the Rand study, is not yet etermined.)

hat effect might these undercounts have upon other emographic indicators for minority populations?

pecifically, what do you think that these undercounts ight mean for the calculation of unemployment rates?

he New York Times Dec. 24, 1972, p. 1

U.S. UNDERCOUNTED RELIEF HERE BY 40%, H.R.A. SAYS

Rand Study Says City May Be Losing Federal Money Through Census Error

A study commissioned by the city's Human Resources Administration charged yesterday that the 1970 Federal census had undercounted the city's welfare cases by 40 per cent.

As a result, the study said, the Federal Government could be shortchanging the city on antipoverty funds and other money it supplies on the basis of census figures.

The study, prepared by the New York Rand Institute, said the census implied that there were some 291,000 welfare cases in the city during 1969, for which the city paid out about $520-million.

Not Checked With City

However, it continued, the city's own Social Services Department recorded some 477,000 cases on its rolls during 1969, for which it paid out more than $883-million.

The Census Bureau never checked its figures with the city before reporting them, the Rand study said.

Robert F. Carroll, the Human Resources deputy administrator, said yesterday that the H.R.A., and the Rand Institute were "still engaged in very serious analysis of what the consequences of this undercount will mean and what course the city might take."

He added that there was no way of telling how much the city might lose in Federal funds as a result of the undercount.

Many Programs Affected

The Rand study said the undercount could affect programs financed or sponsored by Federal revenue sharing, Model Cities, Office of Economic Opportunity and the Department of Health, Education, and Welfare, as well as legislative representation in districts where there had been significant population losses.

Mr. Carroll said the $70-million Community Development Agency and Council Against Poverty programs were two specific areas that might be shortchanged.

Both are involved in job training, health, and economic self-help programs in disadvantaged areas.

He said the study "simply confirmed what we have suspected all along — that there have been serious undercounts in the cities, especially in disadvantaged areas."

The Rand study's author, Dr. C. Peter Rydell, ruled out statistical error as a cause of the undercount.

Embarrassment Cited

Instead, he suggested two causes: "Either the Bureau of the Census simply failed to locate some welfare recipients because they were too mobile, or people on welfare failed to tell the census they were on welfare." He said it is probably that welfare families are embarrassed to identify themselves as such to census-takers.

The Federal Government makes substantial contributions to city welfare

payments in several assistance categories, such as aid to dependent children. However, Mr. Carroll said these payments would not have been affected by the undercount since they are made on the basis of the city, not the Federal, figures.

Census Bureau officials could not be reached immediately for comment on the study.

The New York Times **Apr. 29, 1973, p. 3.**

CENSUS MILLIONS MISSED

Washington — "Stand up and be counted," the voice on soul radio stations across the country urged ghetto residents during the 1970 census, but there were many who never heard the message or failed to heed it.

The Census Bureau reported last week that it had missed counting an estimated 5.3 million persons. And though two-thirds of the uncounted were white, the political and economic impact of the miscount clearly will be felt more by blacks and other minority city dwellers.

The Bureau reported the undercount of whites was 3.45 million, or 1.9 per cent of the total white population; and 1.88 million blacks, or 7.7 per cent of the total black population.

The economic significance of the miscount is that many state and Federal programs which help the poor in the inner cities, such as general funds and revenue sharing, are allocated on the basis of population and per cent of population. For example, one-third of the city's revenue-sharing monies are based on population figures.

Important Differences

The political significance involves the apportionment of population in designing districts for elected offices. Variances of 7 or 10 per cent can make important differences in reapportionment. The political loss for blacks, especially in local elections, could be just as crucial as the economic effect for a people seeking to gain more power in most of the nations' big cities.

Much worse, probably for cities with a high number of Spanish-speaking people such as New York — is the fact that the Census Bureau said it was unable to make estimates of Spanish-speaking undercount due to unreliable data.

Officials at the Census Bureau listed as reasons for the undercount: increased resistance to census-takers because of changing life styles and more distrust of authority; organized protests of the census as an invasion of privacy; and the reluctance of some census-takers to work in ghetto areas at night. Moreover, the Bureau said there is nothing that can be done about the undercount.

Some of the blame for the miscount must be shared by the poor, some of whom may have not cooperated with the Bureau's attempt to reach out. The poor tend to distrust anything related to the government and often do not distinguish between a census taker and, say, a welfare inspector.

'Victim of Undercount'

The Bureau's announcement brought immediate criticism. "We've maintained all along that we were the victim of an undercount," remarked Thomas Morgan, an aide to Mayor Lindsay of New York. "We don't know how much, but we've lost state and Federal monies."

One persistent critic of the Census Bureau has been Dr. Robert Hill, who directed a National Urban League task force for an accurate black count. Mr. Hill, who has maintained that the black undercount might be as high as 15 per cent, took strong exception to the Bureau's position.

"What do they mean they can't apply those figures to the population?" he asked rhetorically. "Why should they make the undercount survey merely for scientific reasons? The figures should be adjusted automatically and applied immediately for financial purposes. It would mean thousands of dollars for localities."

Census officials expected the criticism. But at a time of growing distrust of government, the officials felt it was important for the Bureau to attempt to maintain some credibility. This was the reason for releasing the undercount.

The officials said they believe it important to get an accurate count of the inner city

because the cities need the money. Moreover, they feel the undercount hurts rapidly growing suburban areas as well.

For the Bureau to have volunteered the assessment of its own shortcomings provided an interesting contrast to the growing view that the government tries to hide its mistakes. The Bureau voluntarily made public the careful analysis because of its concern for its reputation and integrity. Actually the 1970 count was an improvement over that of 1960 because of better counting techniques, such as integrating postal data.

As for the Bureau's position that nothing can be done about the miscount, one census official said:

"We don't know exactly where the undercount is. We may give New York too little and Detroit too much. And we can't just add the new figures to the population. We would need addresses and other characteristics of the undercount." – Paul Delaney

VALUES CLARIFICATION

INTRODUCTION

This exercise is divided into two parts. The first contains a series of questions which you are asked to rank in the order with which you agree with them. The second inquires about the manner in which you value certain ideas or issues. Neither part seeks to test your knowledge. Please give your honest reaction since the purpose of the exercise is to help you to clarify your stand on population-related issues.

PART I: Rank Order

A series of questions follows. Answer the questions by ranking the alternatives in the order with which you agree with them. For example, write "1" next to the choice with which you most strongly agree, "2" next to your second choice, and so on.

1. Which of these problems do you think is the greatest threat to humankind?
   ____ nuclear war
   ____poverty
   ____overpopulation
   ____environmental degradation

2. Which would you give lowest priority to today?
   ____space
   ____ poverty
   ____ defense
   ____ ecology

3. Which would you prefer to give up if necessary?
   ____ economic freedom
   ____religious freedom
   ____ reproductive freedom
   ____ political freedom

4. Which do you think is least desirable?
   ____keeping an unwanted child
   ____getting an abortion
   ____ giving up a child for adoption

5. Which of the following measures should be taken to alleviate the population problem?
   ____ legalize abortion
   ____limit each family to two children and sterilize the parents afterwards
   ____ trust people's common sense to limit the size of their families
   ____ distribute birth control information everywhere

6. With whom does the responsibility for determining the size of the nation's population lie?
   ____ individual couples
   ____the federal government
   ____ religious groups
   ____ no one

7. What is the most serious problem in cities today?
   ____discrimination in jobs and housing
   ____transportation
   ____hunger
   ____overcrowding

8. Where would you least like to live?
   ____in a ghetto
   ____ in Chinatown
   ____ in a wealthy suburban area
   ____ in a poor rural town

COMMENTS

The purpose of this section is to raise some population issues and to put them in a larger context. Population issues are only one part of a larger group of problems on which persons are asked to make decisions. What priority do population problems have in your set of concerns? You might think carefully about this questions before proceeding to the next section.

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PART II: A Values Grid

A number of population-related issues are listed below. Please examine the list. Have you thought about each of these topics? There is no need to indicate your approval or disapproval here, but keep a mental inventory of your reactions. *After* you review the list, please turn to the next page where you will be asked a series of questions about each of the issues.

1. large family size (4+ children)
2. persons not marrying
3. sex education in schools
4. abortion when health of mother is endangered
5. childless marriage
6. limits on immigrants from Middle East or Asia
7. free population movement within the United States
8. sterilization with spouse's consent
9. pressure on minority groups to limit family size
10. marriage at 17
11. abortion up to sixteen weeks
12. limits on number of immigrants annually
13. pressure on foreign countries to limit growth
14. contraceptive aid to unmarried minors
15. rights of suburban areas to limit growth
16. trial marriage
17. abortion upon request
18. limits on immigrants from Western Europe
19. contraceptive aid to developing countries
20. sterilization without spouse's consent
21. small family size (1 or 2 children)

COMMENTS:

Obviously, this list could be even more lengthy, but it suggests how complex population issues can be. Were there any contradictions in your reactions to these items? For example, some people argue that there should be free population movement (migration) within the United States, but then agitate for restrictive zoning laws for their community to prevent certain "kinds of people" from moving in.

Now turn to the next page.

The issues that you just reviewed are listed in the left-hand column on the grid below. The other columns are to be used to evaluate the process by which you derive your value. Answer each of the eight questions about the issue. Indicate a positive reaction by placing a check mark in the appropriate column. If your reaction is negative, leave the box blank. *Whether you agree or disagree with the statements does not matter in this exercise. It is the process of valuing that is important.*

1. Have you considered this position *previously?*
2. Are you *proud* of (do you prize or cherish) your position?
3. Have you *publicly affirmed* your position?
4. Have you chosen your position from *alternatives?*
5. Have you chosen your position after *thoughtful consideration* of the pros and cons and consequences?
6. Have you chosen your position *freely*?
7. Have you *acted* or done anything about your beliefs?
8. Have you acted with *repetition*, pattern, or consistency on this issue?

ISSUE	1	2	3	4	5	6	7	8
1. large family size (4+ children)								
2. persons not marrying								
3. sex education in schools								
4. abortion when health of mother is endangered								
5. childless marriage								
6. limits on immigrants from Middle East or Asia								
7. free population movement within the United States								
8. sterilization with spouse's consent								
9. pressure on minority groups to limit family size								
10. marriage at 17								
11. abortion up to sixteen weeks								
12. limits on number of immigrants annually								
13. pressure on foreign countries to limit growth								
14. contraceptive aid to unmarried minors								
15. rights of suburban areas to limit growth								
16. trial marriage								
17. abortion upon request								
18. limits on immigrants from Western Europe								
19. contraceptive aid to developing countries								
20. sterlization without spouse's consent								
21. small family size (1 or 2 children)								

COMMENTS:

This procedure has helped you to examine the way in which you have developed your values about certain population issues. The items that you have considered are ones that evoke considerable controversy in American society today. You will encounter them again, both in this course and in the future. They are worthy of your consideration.

NOTE: The two parts of this exercise are adapted from Sidney B. Simon, Leland W. Howe, and Howard Kirschenbaum, Values Clarification - A Handbook of Practical Strategies for Teachers and Students, **(New York, 1972).**

COMMUNITY POPULATION GROWTH

Questions of population growth are not just national or international issues. They also trouble states, regions, and local communities. The newspaper account reproduced below suggests the response of one community to the "threat" of increasing population. It concludes with several questions. Ignoring the constitutionality of the issues involved, discuss the situation. What are your reactions to Boca Raton's problems and its solutions?

Reproduced from The New York Times
February 9, 1973, p. 31, 57.

RICH BOCA RESOLVES TO STOP GROWING

by Jan Nordheimer

Boca Raton, Fla., Feb. 8 Boca Raton has more polo fields (four) than it has bowling alleys (one), a cost-of-living index higher (122.0) than New York City's (117.5), and a growth rate (nearly 600 per cent in the last dozen years) greater than Jack's beanstalk.

Although its population of 41,000 is not much larger than that of a few square blocks in a big-city ghetto, the wealthy residents of Boca Raton decided last fall to throw up a sunshine curtain against the hordes that the Seven Santini Brothers and North American Van Lines were daily dumping into the city.

They imposed a legal limit on the city's population, decreeing that no more than approximately 100,000 persons shall be entitled to settle in Boca Raton, a level that might have been reached by the end of this decade if growth was allowed to continue unchecked.

It is the same resistance to unbridled growth that has been voiced in other parts of the country in recent years. But the Boca Raton law is one of the first attempts at anti-growth legislation. And the fact that the law was promulgated in Florida, a state that has waved the banner of bigness all this century, is close to heretical.

The Masses Unwanted

If this sounds snooty, it may well be, but most Boca residents are convinced that masses of people would ruin the order and tranquility that attracted them to the community in the first place.

"Look what's happened to Pompano Beach!" was the war cry of one anti-expansion leader. "It has used-car lots and porno shops and hippies!"

Nothing like that exists in Boca Raton, which wears a quiet elegance, and, like the stock market, measures the quality of life with climbing indices.

Indeed, the higher one aspires here, the more money it takes to get there. The penthouse at the top of the 27-story tower at the Boca Raton Hotel and Club rents for $750 a day. The purchase price of apartments in the high-rise condominiums along the oceanfront climbs above $100,000.

And the Boca Raton Community Hospital, built by private subscription and without the aid of local or Federal taxes, has private suites on its top floor that cost $110 a day...

The spiraling costs, in both life and death, have been one product of the rapid growth of Boca Raton in the last decade, a period when it was among the leaders of the boom in Florida prestige retirement communities, attracting upper middle class couples with a strong penchant for country club life styles.

In 1960, Boca Raton had less than 7,000 residents, but by 1970 the population had ballooned to 28,500. It is estimated that more than 12,000 additional people have

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taken up residence in the Atlantic Coast resort since the 1970 census, and by 1975 the total figure is expected to top 70,000.

The 'Population Cap'

The "population cap", as the new law is called, limits the number of dwelling units - both apartments and houses - to 40,000, a level that should make the population plateau at about 100,000, according to projections.

"We estimate that the cost of providing municipal services increases sharply above 100,000," said William H. Law Jr., the new city manager. "That's the break point when everything starts to cost a lot more."

Moreover, a moratorium on all building permits has been ordered to prevent a chaotic construction binge, as developers would presumably rush to get projects under way before the lid clamps down. Resumption of construction will be allowed this summer, and it is expected that competition for the trickle of permits will be fierce.

All this has had the effect of kiting property values, sending the price of vacant residential lots up by more than 25 per cent since the vote in November, and adding at least another 15 per cent to the value of existing homes.

Still to be faced is the legal argument on the constitutionality of the population cap. Do homeowners have the right to impose their will on the property rights of the real estate developer and speculator, beyond the nominal circumstances of zoning and building controls? And does a community have the right to shut out the rest of the world like a medieval walled city?

RISK POPULATION

In the measurement of any phenomenon by a rate ("a quantity or degree of a thing measured per unit of something else"), it is imperative that the numerator and denominator of the rate be defined in similar terms. If the numerator is restricted to the number of events occurring to a specific population, then the denominator must be that population and not a segment of it or a larger population of which it may be a part. This denominator is commonly called the *reference population.*

Within any given population, however, not every one may be equally exposed to the event that is being measured (the denominator). To illustrate this, consider the construction of crude birth rates which can be expressed by the following formula: CBR = B/P. The numerator is the number of births occuring in the total population. Yet, most persons are aware that not everyone in the population stands the "risk" of becoming pregnant. This experience is restricted to women and generally to those aged 15-44 (or 49). If the proportion of women in these ages differs between two populations, then the crude birth rates of those populations are almost impossible to compare.

To begin to correct for this difficulty, a series of more refined birth rates have been developed. (Another procedure, standardization, will be considered later.) For example, the general fertility rate uses the number of women of childbearing age as the basis of calculating the birth rate rather than the total population. Other more refined techniques are also available.

This goal of identifying the population at risk or restricting the denominator in computing a rate to those persons who are exposed to the event can be used as a standard in other areas. For example, computing physician/population ratios could involve consideration of the different needs and demands upon physicians by various segments of the population. Age, sex, race, income, and education may all be determining factors.

One final point deserves mention. To take account of risk, rates do not necessarily need to involve population in the calculations. Rates that relate events to the amount of exposure to the event may be equally revealing. For example, comparing the industrial accident rate for a five-year period for a factory in which the number of workers remained constant but production increased sharply might be best accomplished by computing the rates using number of accidents as the numerator and number of hours that the assembly line was in operation as the denominator. Other refinements could be suggested.

FATALITIES AND PRIVATE FLYING

The following exercise is outlined to acquaint you with the concept of risk population more fully. Begin by reading this excerpt from *The New York Times*:

DEATH RISE NOTED IN PRIVATE FLYING
1069 Fatalities Listed by Safety Group for 1966

Chicago The National Safety Council reported today that general aviation accidents accounted for 80 per cent or 1,069 of the 1,340 civil aviation deaths reported by the Civil Aeronautics Board in 1966.

It was the third straight year in which deaths in general aviation, as opposed to commercial or military aviation, topped the 1,000 mark. The 1965 death toll was 1,018 and the 1964 figure, 1086.

To combat the rising death toll, members of the council's general aviation committee proposed annual psychological examinations for pilots who carry passengers for hire, better flight instruction, safer private planes, and improved airports.

Sidney Smith, a council statistician, noted that in the 10-year period from 1956 to 1966, general aviation deaths increased 60 per cent.

(1) With the statistics provided below, attempt to draw some conclusion about what qualifications Mr. Smith went on to include in his summary of aviation deaths by employing the general notion of risk population.

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(2) Outline the changing risks of general aviation between 1955 and 1966 (with respect to mortality) by using the accompanying data.

(3) Discuss what variables of population you might want to employ had it been necessary to make this assessment of changing mortality due to general aviation from population statistics alone.

ACCIDENTS, FATALITIES, RATES
U.S. GENERAL AVIATION
1955 – 1966

Year	Total	Fatal	Fatalities	Hours * Flown (000)	Plane-Miles * Flown (000)
1955	3,343	384	619	9,500	1,216,000
1957	4,200	438	800	10,938	1,426,285
1959	4,576	450	823	12,903	1,716,019
1960	4,793	429	787	13,121	1,768,704
1961	4,625	426	76[illegible]	13,602	1,857,946
1963	4,690	482	893	15,106	2,048,574
1965	5,193	536	1,025	16,733	2,562,380
1966 (Prelim.)	5,425**	538	1,069	17,456**	2,697,018**

* Source FAA

** Estimated by CAB

CIVIL AERONAUTICS BOARD
Bureau of Safety
March 31, 1967

Consider the following article from *The New York Times*. It exemplifies the problems resulting from looking at census data without regard for risk, i.e., age, sex, occupation, etc. Washington officials requested a quota of blacks in North Dakota's National Guard which completely ignored the risk concept.

GUARD UNIT GETS A DIFFICULT QUOTA

North Dakota Officers Say Blacks Are Rare

By Andrew H. Malcolm

Bismarck, N.D., March 3 – The North Dakota National Guard has been told by officials in Washington that it must recruit 20 blacks this year to balance its membership racially.

There is one problem. According to a population study by the Guard here, there are only 20 eligible blacks in the entire state...

"My first reaction," said Gen. Le Clair Melhouse, the state's National Guard commander, "was 'Where are the blacks?' " According to the latest census statistics, this rural state along the Canadian border has 2,496 Negro residents.

General Melhouse provided the following breakdown:

> "Of the 2,496 blacks in North Dakota, 2,346 are members of the Air Force or their dependents at bomber bases in Minot and Grand Forks and at radar sites scattered throughout the state. Active military personnel would seem to be unlikely prospects for an enlistment in the National Guard. That leaves 150.
>
> "Of the 150, more than 60 are women. That leaves 90.
>
> "Of the 90, about 40 are either under age 18 or over age 45. That leaves 50.
>
> "Of the 50, more than 30 are college students, many from out of state on athletic scholarships and presumably with little interest in remaining in North Dakota for a six-year National Guard enlistment.
>
> "That leaves about 20 eligible blacks, some of whom may be physically unfit..."

In Washington, National Guard officials studied the latest state census figures for black populations to determine what proportion each State Guard unit should have. "Somehow, they came up with 20 for us," General Melhouse said in an interview, "although according to our calculations, proportionately we need a little bit less than one entire black."

So, in recent days in recognition of the difficulties of recruiting young blacks in a farming state where blacks total four-thousandths of 1 per cent of the population, Washington officials have revised the quota for the North Dakota National Guard. Now, General Melhouse is to recruit just 10 blacks.

POPULATION FORECASTS

The date is early January, 1953. You are a demographer for the General Electric Company and the 75th anniversary of the company is nearing. You have just received the following memorandum from the President of General Electric:

> **To**: Trusted Demographer
>
> **Date**: January 3, 1953
>
> **From**: The President
>
> **Re**: 75th Anniversary Gift
>
> On January 14, 1953, as part of Founder's Day, I am going to announce that the Company will give five shares of stock to every employee who becomes a father or mother on October 15, 1953 – the 75th Anniversary of the Company.
>
> The stock is presently selling at 69 7/8. There are 226,000 employees presently with the Company.
>
> What is this generous gesture going to cost the Company?

The situation is real, only the memorandum is a fabrication. What answer will you deliver to the President? Discuss below and on attached sheets. (It may be a good idea to list the information that you will need to make this prediction before you begin. What factors determine the specific fertility patterns of a particular group like the employees at General Electric?)

Good luck!

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The following article appeared in a national magazine at the time this event was occurring. Read the article and answer the questions.

The Case of the G.E. Babies

The perils and complexities of birth forecasting were encountered last year, in rather extraordinary circumstances, by General Electric. Last January 14, G.E. announced that it would award five shares of its common stock to any employee who had a baby on October 15 – the latter date being the company's 75th anniversary. Originally the company said it expected about 13 winners. It arrived at this figure by applying a daily U.S. birth rate to its own 226,000 employees. This computation actually yielded a prediction of 15 births; but a G.E. public-relations man thought it might be nice to trim the figure to 13, since the latter was the number of original G.E. investors. The mathematics suffered from more than public relations, however. G.E. employees, since they include no children and no one over sixty-five, are obviously a much more fertile group than the population as a whole. When this fact sank in, a company statistician made a new assault on the problem. He estimated that the size of an average G.E. family was 4.2. This meant that the total number of people in G.E. families was close to a million. Applying the crude annual birth rate to *this* group, and dividing by 365, he came up with a new prediction of 72 births on the big day.

What new information does this paragraph provide? What are the implications of this new concept? Based on the additional data, feel free to change your figures, but be sure to explain your reasoning.

POPULATION FORECASTS (SEQUEL 2)

The remainder of the article that was presented in Sequel 1 of this exercise is reproduced below. The article can be found in the January, 1954 issue of *Fortune* magazine. Read the selection and answer the questions that follow.

> As it turned out, there were not 13, 15, or 72 babies born to G.E. employees on October 15. There were 189.
>
> "Subtracting the company's highest expectation of 72 from 189 gives 117 extra babies. Where did G.E. go wrong? Well, among other things, the company made no allowance for the incentive provided by its own stock. This oversight, remarkable in a company that has had a lot to say about capitalistic incentives, was apparently rectified by its employees. The latter not only enjoy having children, but, it appears, they rather enjoy the idea of becoming capitalists. And they seem to have known a good thing. In a generally declining stock market, G.E. common rose, during the pregnant months, from 69 7/8 to 78 7/8.

Why were company predictions so far off? What accounted for the large number of births? Are G.E. employees really that "capitalistic"? What is the economic value of a child? Would some one have a child for an anticipated $400? Or could there have been more involved than the incentive alone?

In retrospect, what information would have been needed to make this prediction? Was this information originally given? Evaluate your reasoning in the three parts of this exercise and comment briefly on what you have learned as a result of working out the various parts, each time getting more information than the time before.

SIMPLE MEASURES OF MORTALITY

Many demographers argue that the most important term in the analysis of populations is "differentials." Through the examination of differences within and between population aggregates, the exact pattern of mortality, fertility, migration, and similar phenomena become clearer. Summary figures such as crude death rates have certain advantages, but they must assume that patterns of death are equally distributed among the various groups that comprise the population: whites having the same death rate as non-whites, males as females, Protestants as Catholics, or native-born as foreign-born.

One need look only at the epidemiological literature to understand the potential of examining differentials in mortality (morbidity, fertility, or migration). For example, a summary rate for deaths from cancer of the cervix among women in New York City in 1955 is an interesting datum. It may become more interesting when compared with (a) a similar rate for the same population ten years earlier or later or (b) a similar rate for other cities or smaller areas. It may become still more interesting when the total rate for cancer of the cervix is calculated not for the total female population, but for Protestant, Catholic, and Jewish women separately. From the epidemiological perspective and the desire to learn more about the cause of cancer, the fact that Jewish women die less than one-half as frequently from this form of cancer than do Protestant and Catholic women is a major finding – a finding that is possible only through employing differentials in analysis.

Part I

The first part of the exercise is to examine differences in mortality in South Africa as shown in the first table. Here there are differentials of age, race (Cape coloured and white), and sex. Using whatever simple methods of analysis (e.g., ratios) you choose, draw as many conclusions as possible for all three from this "survivorship" table about mortality variables in South Africa. [NOTE: The "coloured" population is not the entire "non-white" population in South Africa. Mortality figures are *not* available for Bantus who are in the overwhelming majority in South Africa. The Cape coloured are a racially mixed population that occupies an intermediate status in South Africa. The same term, "intermediate", can be applied to the mortality experience of this group when compared to the whites at one extreme and the Bantus at the other. To empathize with the plight of the Bantus in South Africa, you need look only at the differences between the white and coloured populations and imagine the Bantu-group as being much worse.]

Part II

Tables on "survivors" are derived from life table construction and represent one way by which to assess mortality differentials. A more common way is to work with the actual death statistics and relate them to the population group that experiences that mortality. Therefore, to understand the mortality of the South African population groups under discussion more fully, compute the following series of rates for males and females of both races from the data provided (tables 2 and 3). Answer the questions posed about the various measures and compare the rates in order to discuss differences and similarities. Remember that comparisons can (and should) be made between ages, sexes, and races.

(1) **Crude death rate**

$$\text{Crude death rate} = \frac{\text{Total number of deaths}}{\text{Total population}} \times 1000 =$$

Please remember that this particular rate, while it "controls" for the size of the population when compared to other aggregates, assumes that every person is equally exposed to the risk of dying and therefore does not control for composition of population. Discuss your results.

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(2) **Infant mortality rate**

$$\text{Infant mortality rate} = \frac{\text{Total deaths under 365 days}}{\text{Live births}} \times 1000 =$$

Note the new denominator in the construction of the rate: live births. Besides the problems that might result from underenumeration of this age group in censuses (so universal in fact that it is almost a demographic law), what other reasons might contribute to this choice of denominators? Explain. Discuss your results.

(3) **Neonatal mortality rate**

$$\text{Neonatal mortality rate} = \frac{\text{Total deaths under 28 days}}{\text{Live births}} \times 1000 =$$

Obviously neonatal deaths are included in infant deaths, but it is often desirable to treat them separately. They often arise from factors that seem to be relatively independent of the environment, but rather are due to genetic and developmental problems, although it is increasingly becoming recognized that the "environment" plays an important role here through nutrition and prenatal care. When compared to the differences in the infant mortality rate, how different are the neonatal mortality rates of other similar time periods – under one day, and one to six days? Discuss.

NOTE: This set of calculations is optional.

(4) **Age-specific death rates**

$$\text{Age-specific death rate} = \frac{\text{Deaths in a given age group}}{\text{Population of that age group}} \times 1000 =$$

Rates can be made specific to any characteristic for which both mortality (or fertility,) etc.) information is available when the population statistics are divided by the same characteristic. (Imagine the dismay among demographers when the State of New Jersey temporarily dropped notation by race from its birth certificates and statistics!) Compute the age-specific (and race- and sex-specific) rates for each of the age groups over one year listed. Compare them and attempt to develop some explanation for different patterns by age, sex, and color. Work with one age group of your choice.

SURVIVORS AT SPECIFIED AGES BY SEX, SOUTH AFRICA, 1950–1952

[Number of persons who would survive in the exact age specified out of 100,000 born alive and subject to the mortality conditions of the period indicated.]

	COLOURED POPULATION		WHITE POPULATION	
Age (in years)	**Male**	**Female**	**Male**	**Female**
0	100,000	100,000	100,000	100,000
1	86,199	87,668	96,211	96,995
2	80,913	82,309	95,768	96,610
3	79,191	80,556	95,549	96,452
4	78,491	79,744	95,369	96,328
5	77,987	79,171	95,233	96,214
10	76,601	77,708	94,757	95,791
15	75,753	76,697	94,446	95,511
20	74,094	74,652	93,694	95,106
25	71,498	71,690	92,747	94,587
30	68,506	68,641	91,728	93,960
35	65,097	65,656	90,483	93,121
40	61,220	62,710	88,920	91,974
45	57,145	59,531	86,639	90,388
50	52,244	55,761	83,061	87,964
55	46,109	51,010	77,764	84,488
60	39,205	45,790	70,189	79,779
65	31,486	39,447	60,253	73,148
70	23,715	31,838	48,742	63,877
75	15,989	23,455	35,974	51,225
80	9,791	15,720	22,848	35,690
85	4,927	8,649	11,205	19,927

Source: United Nations, **Demographic Yearbook**, 13th edition (New York: United Nations, 1962), pp. 658–659. For explanatory footnotes and a discussion of limitations of the data, see page 42.

Table 2

DEATHS BY AGE AND SEX,
COLOURED AND WHITE POPULATIONS
SOUTH AFRICA, 1959

AGE	COLOURED POPULATION		WHITE POPULATION	
(days-years)	Male	Female	Male	Female
All Ages	11,866	9,945	15,334	11,362
Under 365 Days	4,260	3,747	1,293	886
Under 1 day	226	199	311	207
1–6	599	477	383	251
7–27	559	385	150	86
28–364	2,876	2,686	449	342
One year and over	7,606	6,198	14,041	10,476
1–4 years	1,955	1,791	263	198
5–9	185	181	112	98
10–14	114	93	112	59
15–19	182	126	207	72
20–24	250	180	286	110
25–34	578	414	545	229
35–44	618	434	812	488
45–54	838	527	1,801	1,039
55–64	972	652	2,582	1,463
65+	1,914	1,800	7,321	6,720

Simple Measures of Mortality – Table 3

AGE AND SEX COMPOSITION OF THE COLOURED AND WHITE POPULATIONS, SOUTH AFRICA, 1958

AGE (Years)	COLOURED POPULATION		WHITE POPULATION	
	Male	Female	Male	Female
Total	677,560	685,264	1,498,824	1,508,423
0–1	26,984	27,565	36,921	35,613
1–4	94,838	92,906	137,581	132,153
5–9	98,040	98,806	162,291	155,844
10–14	81,378	81,086	152,560	147,778
15–19	70,185	68,127	131,031	126,408
20–24	60,212	61,499	116,189	112,850
25–34	92,658	98,002	208,604	207,224
35–44	63,216	62,760	193,192	194,325
45–54	44,929	45,075	173,851	175,142
55–64	25,993	26,114	96,121	108,080
65†	19,127	23,324	90,483	112,946
Live Births*	32,567	31,415	37,609	36,279

*NOTE: A breakdown by sex for births was not conveniently available so for the purposes of this exercise, the total number of live births was divided by the ratio of white males to white females in the age group 0–1. This is not exact. Why? (One clue might be found in a consideration of the reason why the white population was used in both cases and not two separate ratios for whites and coloured.)

SAMPLE MEASURES OF FERTILITY

Various measures have been employed to identify the reproductive performance of populations. The value in not depending upon a single measure and the greater explanation that results from more detailed analysis using increasingly "sophisticated" indexes or rates of fertility can be seen in a recent study of fertility in Bombay, India. This example also illustrates the hazards involved in explaining a low birth rate simply by the prevalence of contraceptive practice.

Bombay has had a vigorous family planning program for a number of years and, given the fact that it has a relatively large middle-class, it might be expected that its birth rate might be lower than the rate for India as a whole. Indeed, this can be shown. The crude birth rate for Greater Bombay since 1951 has ranged between 26 and 31 per 1000 while the comparable figure for India, according to best estimates, has not dipped below 40 per 1000 population. One might conclude that this lower rate results from the larger middle class and the greater prevalence of contraceptive practice.

But a more refined measure of fertility, the general fertility rate, which relates the number of births to women 15–44, permits a quick comparative picture. Here the rates for Bombay when corrected for under-registration is 184.6 which is higher than the estimated general fertility rate for India as a whole – 177.9 per 1000 women aged 15–44. Obviously, this changes the reasoning on the role of contraceptive practices in the fertility of Bombay women.

For the present purposes, the reasons for this situation are less important than the fact that different measures of fertility present different pictures of reproductive behavior and its possible causes. Among the reasons, however, can be listed the large proportion of Bombay women in the 15–44 age group who are unmarried compared to India women as a group (25 and 15 per cent respectively), the relatively low proportion of women of reproductive age in Bombay's total population because of the large number of in-migrant males, and the completeness of reporting through the birth registration systems.

Given this example, carefully examine fertility differentials by race in the United States from the data provided on the attached page. Compute the following fertility measures for both whites and non-whites to aid in this analysis:

(1) the child/woman ratio:* $\frac{\text{children 0–4}}{\text{women 15–44}} \times 1000 =$

(2) the crude birth rate: $\frac{\text{number of births}}{\text{total population}} \times 1000 =$

(3) the general fertility rate: $\frac{\text{number of births}}{\text{women 15–44}} \times 1000 =$

(4) age-specific birth rate: $\frac{\text{number of births to women of age X to X+5}}{\text{women of age X to X+5}} \times 1000 =$

*This is a special measure that is different from the others in one important respect. What is this difference and what implications might it have for fertility analyses in developing areas? Discuss in a footnote to your exercise.

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Discuss what each measure adds to the understanding of fertility in general compared to the one before it and the additional knowledge that you gain about racial differences in reproductive behavior in terms of magnitude, nature, and timing of such differences. Draw what conclusions you can about these fertility differences by race.

NATALITY STATISTICS – UNITED STATES, 1963

POPULATION	WHITES	NON-WHITES	TOTAL
Total Population	166,454,000	22,078,000	188,532,000
Total Female Population	84,538,000	11,367,000	95,905,000
Total Females, 15–44	33,248,000	4,541,000	37,789,000
15–19	6,708,000	955,000	7,663,000
20–24	5,513,000	770,000	6,283,000
25–29	4,823,000	699,000	5,522,000
30–34	5,041,000	719,000	5,760,000
35–39	5,561,000	728,000	6,289,000
40–44	5,602,000	670,000	6,272,000
Total Number of Children 0–5	17,541,000	3,181,000	20,722,000
BIRTHS			
Total Births, 15–44	3,326,344	638,928	3,965,272
15–19	445,892	135,324	581,216
20–24	1,202,804	207,712	1,410,516
25–29	844,250	142,762	987,012
30–34	496,358	89,836	586,194
35–39	260,998	48,744	304,742
40–44	76,042	14,550	90,592

STANDARDIZATION

[Note: This exercise is set up in two parts. The first part is designed to help arrive at a solution to the particular problem on your own. The second provides additional information. Since grades are not assigned, there is no reason to solve the problem early if you are unable to do so. Therefore, do not look at Part II until you have at least tried Part I.]

PROBLEM

One of the difficulties of a "crude" rate -- be it related to fertility, mortality, or another demographic event -- is that it assumes that everyone in the population being measured has an equal risk of being exposed to the event, when in reality we know that this is not true. In the case of mortality, for example, every layman knows that there are distinct patterns by age, by cause of death, and certain environmental conditions, to mention but a few.

Therefore, when crude rates are reviewed for two separate populations, a serious student of demography must ask whether the differences or similarities that appear are real differences of mortality (or fertility) experience or whether they are the results of differences in population structure (e.g., age-sex composition) or other factors.

The mortality of Alaskans in 1950 (to pick a convenient census year) is an excellent example. The crude death rate for Alaska in that year was 9.7 deaths per 1000 population. At the same time, the crude death rate for the entire continental United States was only 9.6 per 1000. Certainly, a comparison of these figures would quickly lead one to correct his impressions of the rigors of a "frontier" society bordering on the Arctic! Yet a comparison of the infant mortality rate -- one of the best indicators of health conditions -- reveals that the figures for the entire United States was 29.2 per 1000 live births, while the rate for Alaska was 51.8 per 1000 live births. Other comparisons of age-specific death rates (e.g., deaths to population aged 1--4 divided by size of population 1--4 times 1000; and so on for each age group) could reveal similar differences.

A second quick comparison reveals that the age distribution of the Alaskan population must be quite different from that of the United States. While 28.8 percent of the United States population was over 45 in 1950, only 16.8 percent of the population of Alaska exceeded that age. So the similarity in the crude death rates for 1950 needs to be examined very critically.

Part I

Given the population and mortality figures by age for Alaska and the United States in 1950 in the accompanying table, what calculations could be made that would take differences in age structure into account in comparing the mortality experience of the two areas? Present your figures and describe your reasoning.

POPULATION AND DEATHS, ALASKA AND UNITED STATES, 1950

Age	Population -- 1950		Deaths -- 1950	
	United States	Alaska	United States	Alaska
0-- 4	16,163,571	15,556	121,973	276
5-- 9	13,199,685	10,627	8,150	24
10--14	11,119,268	7,858	6,457	16
15--19	10,616,598	10,815	11,531	44
20--24	11,481,828	17,168	16,767	64
25--34	23,759,267	26,438	42,467	120
35--44	21,450,359	18,511	76,937	113
45--54	17,342,653	10,649	148,087	127
55--64	13,294,595	6,215	254,150	136
65--74	8,414,885	3,414	342,296	179
75--84	3,277,751	1,137	305,851	112
85+	576,901	192	116,516	38
TOTAL	150,697,361	128,580	1,451,182	1,249

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PART II

Obviously one beginning attempt to answer the question asked above would be to present tables of age-specific death rates and look at the differences. But one of the goals of population analysis is to reduce the calculations and comparisons to a single summary figure or figures whenever possible. So a different strategy might be to build upon the age-specific death rates and ask the following questions: What would be the mortality experience of one population, given its particular age composition, if it had the age-specific death rates of the other? Essentially, this presents an opportunity to compare the death rates of two areas if they had exactly the same age structure.

Therefore, compute the death rate for the United States if it had Alaska's mortality experience (as expressed in age-specific death rates) in 1950 according to the following table and using data accompanying this exercise:

	1	2	3	4	5
Ages	Population U.S. – 1950 (Standard)	Population Alaska–'50	Deaths in Alaska–'50	Age–specific Death Rates, Alaska, 1950 (3/2 x 1000)	Expected No. of Deaths in Standard Population if it had Alaska's Death Rates (4 x 1/1000)
0–4					
5–9					
.					
.					
.					
etc.					
TOTALS					

$$\text{Standardized Death Rate} = \frac{\text{expected number of deaths in standard population using Alaska's rates}}{\text{Total Standard (U.S.) Population}} \times 1000 =$$

Compare your answer with the actual rate for the United States in 1950. Discuss what you have done and its implications.

A final note: This exercise has used the United States population as a standard against which to compare the mortality experience of Alaska. There is no reason, however, why another standard population could not be used against which the mortality (or fertility) of one, two, three, or fifty other populations could not be assessed. For example, Massachusetts and Mississippi, with similar death rates at certain points in time, but with quite different age *and* racial composition as well as health delivery systems, could be compared by applying their rates to the total United States population (by age and race categories) as the standard. The general, but flexible rule is to use the population of the geographic unit of which the area(s) under study are part. (Also, lest the examples given confuse you, standardization is not only used to see why populations which are different might have similar rates, but it can be used to examine why certain rates may be different.)

This particular method of standardization is called the *direct* method. Another variation, *indirect standardization*, can be employed when information such as the vital rates are missing for small population units, but compositional data are available. It is not uncommon in history and in certain areas of the developing world today to have such a situation.